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ABSTRACT

Multimedia is a powerful tool that will change both the way we look at knowledge and our vision of reality, as well as our educational system and the business world. Multimedia as used here refers to the innovation of mixing text, audio, and video through the use of a computer. Not only will there be new products emerging from multimedia uses, but multimedia may also change the way we think and solve problems--just as in recent years, word processing, spreadsheets, and databases have changed how we think about writing, accounting, and information access. Multimedia will affect education by providing instructors, students, and others with a dramatic new environment for presentations--i.e., they will no longer be bound by the limits of illustrating processes on chalkboards or in slide presentations. Multimedia holds great promise for improving the quality of education by providing the ability to illustrate ideas with visual, audio, text, or any combination of media so that users can create new ways of communicating ideas. Teachers will be freed from the constraints of textbooks and chalkboards, and students who have difficulty expressing ideas in writing can now have a new way to communicate and a new class of material to learn from. Multimedia allows the user to be an active learner, controlling access to and manipulating vast quantities of information with a computer. (EW)

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New Visions of Reality: Multimedia and Education

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> "Fifteenth-century Europeans 'knew' that the sky was made of closed concentric crystal spheres, rotating around a central earth and carrying the stars and planets. That "knowledge" structured everything they did and thought, because it told them the truth. Then Galileo's telescope changed the truth.
>
> "As a result, a hundred years later everybody 'knew' that the universe was open and infinite, working like a giant clock. Architecture, music, literature, science, economics, art, politics—everything—changed, mirroring the new view created by the change in the knowledge." (Burke p.9)

Multimedia, like Galileo's telescope, is a powerful tool; it will change the way we look at knowledge and give us a new vision of reality. The change in our view of knowledge brought about by multimedia will not take one hundred years as it did with Galileo's telescope. The changes are already happening.They started with the wide acceptance of the microcomputer and continue as we move toward videocomputers, interactive television, and electronic books. Three industries—computers, television, and publishing—that were quite separate during the sixties started to overlap in the seventies and eighties. By the nineties the three industries will be even more intertwined. The products of these industries provide the content and media for education. Consequently, the new reality of multimedia will change education.

The purpose of this book is to give you a glimpse of multimedia in education. Conference participants from the fields of computer science, television, and publishing will share their vision of multimedia with you.

How do you explain something new for which the words have not yet been invented? One way is to show it! That is why this book is basically a collection of examples. Computer-controlled multimedia is new, so examples are necessary to define the medium, develop the vocabulary, and explore new dimensions of content, software, and hardware. When you have finished reading the book you should have a better idea of what multimedia is and why it is likely to have a major impact on education as well as business.

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What is multimedia?

We'll start with a short history and a working definition of multimedia.

Multimedia without computer enhancement is not new. For example cave drawings in France are a record of early man's images of animals. These records were made with various media, probably using stick tools.

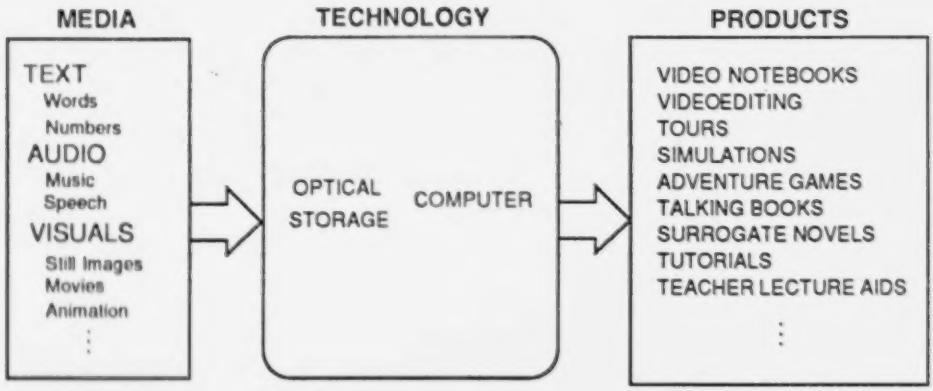
A more recent and varied example of multimedia is found in a kindergarten class, where you'll find paints, crayons, filmstrips, books, records, and clay—all examples of media, and all tools for multimedia production. The products of this media-rich environment can include a picture of ladybugs made with thumbprints, a green clay frog, and felt-pen illustrations for stories.

What is new and exciting is the innovation of mixing text, audio, and video with a computer. Computer-supported multimedia is a new technology-based medium for thinking, learning, and communication. Users can browse, annotate, link, and elaborate on information in a rich, nonlinear, multimedia data base. Going beyond the traditional pencils, crayons, chalk, paint, clay, books and the other traditional classroom paraphernalia, computer-based multimedia learning stations will allow students and teachers to explore and integrate vast libraries of text, audio, and video information.

Automated nonlinear text was first described by Vannevar Bush as a "memex" device in which an individual could store books, records, and letters in a form such that specific information could be retrieved rapidly. Theodor Nelson used the term "hypertext" in the early 1960s to describe the idea of nonlinear reading and writing implemented on a computer system for annotating and connecting ideas; Doug Engelbart developed a number of hypertext systems in his SRI lab during this time. The term "hypermedia" simply extends hypertext to include video, audio, and animation in addition to text. As used in this book, multimedia, hypermedia, and intermedia refer loosely to the same class of presentations. I will use the term multimedia in this chapter.

Multimedia can be examined in three parts: media, technology, and products.

MULTIMEDIA ELEMENTS



Media includes text, audio, and visuals. The *technologies* that make multimedia possible are optical storage and computers. Multimedia *products* are just emerging; they include video notebooks, video editing, tours, simulations, adventure games, talking books, surrogate novels, tutorials, and teacher lecture aids. Users and developers will start with conventions that they understand—television, books, films, computer games, computer-aided instruction—and then discover new ways to use the multimedia environment.

Not only will there be new products emerging from multimedia uses, but multimedia also may change the way we think and solve problems—just as in recent years, word processing, spreadsheets, and data bases have changed how we think about writing, accounting, and information access. Multimedia will enable new ways of analyzing information to evolve and new insights to be achieved in many disciplines. Some of these insights may come from relative novices in the fields, because of the easy access to basic content. Users can communicate with each other easily, so compound documents can be created by many authors working simultaneously. Or a single author may produce a very rich visual presentation. In addition, the results of the work can be displayed in print, disc or video form.

The technology components of multimedia will change with time. Today, a multimedia application typically requires a computer-controlled videodisc and/or CD ROM player. Eventually, there will be video computers with many multimedia capabilities built in or available as modules. Multimedia will only get faster, less expensive, and more capable of doing useful activities. What are some of the useful activities for multimedia in education—how will multimedia be used in education?

How will multimedia be used in education?

I have presented what multimedia is and how it may change with time. Now I would like to describe a few examples of what multimedia could be like for students, teachers, university professors, and business people. More detailed examples of multimedia applications are the subject of this book. My purpose here is to suggest what is possible with multimedia.

A sixth-grade science student is asked to do a science project. The student is very interested in the astronomical phenomenon of "eclipses," and decides to do her report about them. Instead of merely summarizing the encyclopedia article on the subject all too often, the time-honored approach for preparing a written report, the student collects various texts about eclipses from sources on a CD ROM. In addition, she views an astronomy videodisc and copies a diagram of eclipses of the sun and moon, and a short movie clip of a total eclipse of the sun, taken in Bolivia in 1966, that dramatically reveals structural details of the sun's corona. She then uses off-the-shelf software to write title and credits, to create an animation sequence for the path of a total solar eclipse, and finally to dub in Star Wars music. Putting all the elements together with a computer, the student creates her own multimedia video science documentary. With multimedia, the student has a new way of communicating vividly what she has learned about eclipses.

A high school history teacher is preparing a lecture on civil rights. Instead of just lecturing to his students about civil rights, the teacher really makes the subject come alive with a multimedia videodisc that includes video news clips of the civil rights marches of the sixties, and Dr. Martin Luther King's famous "I have a dream" speech. The teacher selects the text of relevant court cases from a CD ROM, and visual and audio information from a videodisc, to create a powerful, animated educational experience for students.

A university professor of developmental psychology is writing a textbook. The professor and the publisher decide that a companion videodisc of milestones in human development would be a useful research and learning aid for students, because the subject matter of early human development is so rich visually—and is difficult to communicate with traditional text and still-image forms alone. Furthermore, the existing vast quantities of film and sound information on the subject have historically been difficult to access. Multimedia is an ideal way to show students, for example, the differences among one-year-olds in motor behavior. The professor proceeds to develop a videodisc that is integrated with the textbook. Since the material covered by most textbooks is overlapping, the videodisc has broad appeal as a lecture aid and can be used with many different textbooks. In fact, the market for the videodisc extends beyond college courses—it's an ideal product for new parents.

A data communications company hires a new sales engineer. Instead of sending him back to the factory for two weeks of individual product training, the company gives him a computer-controlled videodisc of new products and applications. The salesman could further use the training material to create a videotape for a key customer sales presentation. His locally produced videotape would stress particular product applications of interest to his customer, edited from the company-produced training videodisc. Multimedia can save time and money in field training, and give a field sales engineer a highly visual, customized, and persuasive way to communicate with a customer.

In sum, multimedia will provide instructors, students, and others with a dramatic new environment for presentations. They will no longer be bound by the limits of illustrating processes on a chalkboard or in slide collections. Vast libraries of audio, visual, and text material will be easily accessed by the computer. In addition, the user can integrate such existing computer programs as word processors, graphics, and data files. Instructors and students will have the opportunity to create their own classroom videos for presentation and personal video notebooks. Students and teachers alike will be able to become "video producers" or "video publishers" utilizing the vast data bases at their command for images, sounds, and text.

Researchers will use multimedia for new approaches to scholarship. Multimedia will allow a level of analytic control not possible in viewing traditional film, audio, or print materials. Multiple scholars will be able to work on the same multimedia database simultaneously, combining their analysis of different aspects of the field.

The business world will discover that "desktop video" is a powerful method of communicating within the company and to customers. For example, businesses will have an efficient method of delivering consistent training at off-site locations.

Why is multimedia important in education?

Multimedia is important in education because it holds great promise for improving the *quality* of education. People have been dreaming about easy access to information that has the richness of multiple images, and sounds, and multimedia begins to deliver on the dream. Multimedia provides the ability to illustrate ideas with visual, audio, text, or any combination of media, so users can create new ways of communicating ideas. For example, instead of just using text to teach about the Constitution, teachers can enliven class discussion with rich visuals such as paintings of the drafters of the Constitution, maps of colonial America, political cartoons, and a film clip from the play "1776." Of course the visual information can be linked to text from the Magna Carta, the Federalist Papers, or current court cases. In short, teachers and students can have a great learning experience exploring the Constitution.

Teachers can break free from the constraints of textbooks, and the chalkboard. They can back up their imagination with classroom materials they have been dreaming about. Concepts that are difficult to explain, such as meiosis, become clear when you can freeze a frame on a videodisc and discuss it with the students.

Students who have difficulty expressing ideas in writing can now have a new way to communicate and a new class of material to learn from. Children who are used to watching television, listening to music, and playing computer games find multimedia a more compelling learning tool than the book-and-chalkboard educational media of their parents' generation. Finally, multimedia allows the user to be an active learner, controlling access to and manipulating vast quantities of information with a computer.

I trust the examples in this book will help us all to begin to envision the possibilities of multimedia in education. The first chapter is by Doug Engelbart, who began many of the discussions addressed in this book years ago, well before most people understood what he was saying. Our hope is that this book does justice to elaborations and developments of the foundation he provided for us all.

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Sueann Ambron

Sueann Ambron, Ed.D, is the Manager of Education Market Development at Apple Computer. Her responsibilities include investigating new technologies for the education market and building prototype products that demonstrate the promise of new technologies. The National Geographic Society–Lucasfilm collaboration is among the multimedia projects she manages.

Ambron completed her doctorate from Columbia University with honors in 1973 and joined the education faculty at Stanford University. She has been active in the use of technology in education since the early seventies when, as a professor of education, she was faculty sponsor for human-factors students at Stanford University and XEROX PARC. Later, she was responsible for new education product development as a product manager at Atari.

As Manager of Software Products, she was responsible for several award-winning educational software products. Ambron has continued to work in technology and education, including work in artificial intelligence as it relates to multimedia.

Ambron has authored a number of professional books and articles, including a best-selling college textbook on child development.

Ambron's main professional interest is creating superior educational products using new technology. As an educator and futurist, she believes that "a great product is one that makes learning a compelling experience."